What is claimed is:

1. A method for analyzing cells comprising:

(a) providing an array of locations which contain multiple cells wherein the cells contain one or more fluorescent reporter molecules;

(b) scanning multiple cells in each of the locations containing cells to obtain fluorescent signals from the fluorescent reporter molecule in the cells;

(c) converting the fluorescent signals into digital data; and

(d) utilizing the digital data to determine the distribution, environment or activity of the fluorescent reporter molecules within the cells.

2. The method of claim 1 wherein the array of locations are wells in a microtiter plate.

3. The method of claim 1 wherein the array of locations are microwells on a microplate.

4. The method of claim 1 wherein the fluorescent reporter is added to the cell.

5. The method of claim 1 wherein the fluorescent reporter is produced by the cell.

6. The method of claim 1 wherein a computer means converts the digital data into the difference between the average cytoplasmic reporter molecule fluorescent intensity and the average nucleus fluorescent reporter molecule intensity.

7. The method of claim 1 wherein a computer means converts the digital data into the average cytoplasmic fluorescent reporter molecule intensity within the nucleus region.

8. The method of ~~claim~~ 1 wherein a computer means converts the digital data into the average fluorescent reporter molecule intensity within the cytoplasmic mask.

9. The method of claim 1 wherein multiple different fluorescent reporter molecules are in the cell.

10. A cell screening system comprising:

(a) a high magnification fluorescence optical system having an objective lens, an XY stage adapted for holding a plate with an array of locations for holding cells and having a means for moving the plate to align the locations with the microscope objective and a means for moving the plate in the direction to effect focusing;

(b) a digital camera;

(c) a light source having optical means for directing excitation light to cells in the array locations and a means for directing fluorescent light emitted from the cells to the digital camera; and

(d) a computer means for receiving and processing digital data from the digital camera wherein the computer means includes:

i) a digital frame grabber for receiving the images from the camera,

ii) a display for user interaction and display of assay results,

iii) digital storage media for data storage and archiving, and

iv) means for control, acquisition, processing and display of results.

11. The cell screening system of claim 10 having a PC screen operatively associated with the computer means, for displaying graphs of data and images of cells having fluorescent reporter molecules.

12. The cell screening system of claim 10 wherein the computer means stores the data in a bioinformatics data base.

13. The method of claim 1 further comprising scanning multiple cells in each of the array of locations containing cells in high throughput mode, and selectively scanning only a subset of the locations containing cells in a high content mode.

14. The cell screening system of claim 10 further comprising an attached reader which measures a signal from the array of locations which contain multiple cells, and a method to transfer both the array of locations which contain multiple cells and the measurements to the cell screening system.

15. The cell screening system of claim 10 wherein the optical means comprise a mechanical-optical means for changing the magnification of the system.

16. The cell screening system of claim 10 further comprising a chamber and control system to maintain the temperature, CO_2 concentration and humidity surrounding the array of ocations which contain multiple cells.

17. The cell screening system of claim 10 wherein the optical means comprises a confocal scanning illumination and detection system.

18. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute the procedures set forth in Figure 9, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

19. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute the procedures set forth in Figure 11, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

20. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute the procedures set forth in Figure 12, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

21. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute the procedures set forth in Figure 13, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

22. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute the procedures set forth in Figure 14, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

23. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute the procedures set forth in Figure 15, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

24. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute procedures for detecting the distribution and activity of specific cellular constituents and processes, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

25. The machine readable storage medium of claim 24, wherein the specific cellular process comprises the nuclear translocation of a protein.

26. The machine readable storage medium of claim 25 wherein said protein comprises a membrane protein.

27. The machine readable storage medium of claim 24, wherein the specific cellular process comprises cellular hypertrophy.

28. The machine readable storage medium of claim 24, wherein the specific cellular process comprises apoptosis.

29. The machine readable storage medium of claim 24, wherein the specific cellular process comprises protease-induced translocation of a protein.

30. A machine readable storage medium comprising a program containing a set of instructions for causing a cell screening system to execute procedures for identifying novel receptor agonists and antagonists, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

31. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute the procedures set forth in Figure 9.

32. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute the procedures set forth in Figure 11.

33. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute the procedures set forth in Figure 12.

34. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute the procedures set forth in Figure 13.

35. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute the procedures set forth in Figure 14.

36. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute the procedures set forth in Figure 15.

37. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute procedures for detecting the distribution and activity of specific cellular constituents and processes.

38. The machine readable storage medium of claim 37, wherein the specific cellular process comprises the nuclear translocation of a protein.

39. The machine readable storage medium of claim 37 wherein said protein comprises a membrane protein.

40. The machine readable storage medium of claim 37, wherein the specific cellular process comprises cellular hypertrophy.

41. The machine readable storage medium of claim 37, wherein the specific cellular process comprises apoptosis.

42. The machine readable storage medium of claim 37, wherein the specific cellular process comprises protease-induced translocation of a protein.

43. A machine readable storage medium comprising a program containing a set of instructions for causing the cell screening system of claim 10 to execute procedures for identifying novel receptor agonists and antagonists, wherein the cell screening system comprises a high magnification fluorescence optical system with a stage adapted for holding cells and a means for moving the stage, a digital camera, a light source for receiving and processing the digital data from the digital camera, and a computer means for receiving and processing the digital data from the digital camera.

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